Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37	)	ET Docket No. 14-165 RM-11840

REPLY COMMENTS OF MICROSOFT CORPORATION REGARDING MICROSOFT CORPORATION'S PETITION FOR RULEMAKING

Paula Boyd
Senior Director, Government and Regulatory Affairs

Michael Daum
Director, Technology Policy, CELA Privacy and Regulatory Affairs

MICROSOFT CORPORATION
901 K Street NW, 11th Floor
Washington, DC 20001
(202) 263-5900

Paul Margie
Paul Caritj
Joely Denkinger*
HARRIS, WILTSHIRE & GRANNIS LLP
1919 M Street NW, Suite 800
Washington, DC 20036
(202) 730-1300

*Admitted in Colorado only. Practicing under the supervision of DC Bar members.

Robert M. McDowell
COOLEY LLP
1299 Pennsylvania Avenue NW, Suite 700
Washington, DC 20004
(202) 842-7862

June 25, 2019

TABLE OF CONTENTS

INTRODUCTION AND SUMMARY

Microsoft Corporation submits these comments pursuant to Section 1.405 of the Commission's rules to reply to comments submitted in response to Microsoft's Petition for Rulemaking ("Petition").[1] The overwhelming majority of comments reflect enthusiastic support for Microsoft's proposed rule changes. A wide array of commenters explained that granting the Petition will support the expansion of broadband to rural areas and will facilitate innovation in fixed wireless broadband technology.[2] Specifically, rural broadband providers, equipment makers, public interest groups, standards setting organizations, and trade groups expressed support for the proposals Microsoft detailed in our Petition:

- Permitting fixed White Space devices ("WSDs") in less congested areas to operate at a maximum radiated power limit of 42 dBm rather than 40 dBm;
- Permitting fixed WSDs to operate at heights above average terrain ("HAAT") of up to 500 meters, subject to a special set of coordination procedures;
- Permitting geofenced operation of fixed WSDs on mobile platforms;

---

1 Petition for Rulemaking of Microsoft Corporation, ET Docket No. 14-165, RM-11840 (filed May 3, 2019) ("Petition"); 47 C.F.R. § 1.405(b). Unless otherwise noted, all comments cited herein were filed in ET Docket No. 14-165 on June 10, 2019.

2 *See* Comments of ACT | The App Association at 2 ("App Association Comments"); Comments of Adaptrum, Inc. at 2, Docket No. RM-11840 ("Adaptrum Comments"); Comments of Connect Americans Now at 2 ("CAN Comments"); Comments of Dynamic Spectrum Alliance at 3 ("DSA Comments"); Comments of Nominet at 1 ("Nominet Comments"); Comments of Public Interest Organizations at 1–2 ("PIOs Comments"); Comments of RADWIN LTD. at 3 ("RADWIN Comments"); Comments of Evolve Cellular, Inc. and Skylark Wireless at 5 ("Evolve/Skylark Comments"); Comments of Rise Broadband at 1 ("Rise Broadband Comments"); Comments of 6Harmonics Inc., Agile Networks, Cal.net, Declaration Networks Group, Evolve Cellular, Fairspectrum Oy, Network Business Systems Inc., Nextlink Internet, Packerland Broadband, RADWIN, RTO Wireless, Sacred Wind Communications, Inc., Skylark Wireless, Vistabeam Internet, Watch Communications, and WON Communications at 2 ("Rural Partners Comments"); Comments of Sacred Wind Communications, Inc. at 2–3 (filed June 4, 2019); Comments of the Wireless Internet Service Providers Association at 2 ("WISPA Comments"); Comments of Wi-Fi Alliance at 3 ("Wi-Fi Alliance Comments").

- Adopting a clarified set of rules to facilitate the development of narrowband Internet of Things ("IoT") WSDs; and
- Exploring ways to permit fixed WSDs to operate at increased power levels on first-adjacent channels to television broadcasters where the potential for harmful interference is low.

Commenters explain that the rule changes proposed in the Petition will allow service providers to build on the Commission's innovative WSD device rules, which have already laid a foundation for improving connectivity in rural America. As the joint comments of numerous rural broadband providers and device manufacturers explain, the "changes outlined in the Petition will allow us to build on that work and connect even more of rural America."[3] Further, Connect America Network explains that "[t]he proposals in Microsoft's Petition will both better enable ISPs to utilize TVWS technology to bring broadband to rural areas and open up the technology to a variety of new user groups and use cases."[4] And the group of Public Interest Commenters explain that the "pragmatic and long-overdue changes to the TV White Space rules in Part 15" proposed by Microsoft "present the Commission with an opportunity to take important steps to bridge the rural-urban digital divide," and "the modest improvements proposed in the Petition can empower providers to extend higher-speed internet access to more unserved areas."[5]

Commenters also support the Petition because it will advance the FCC's overall spectrum policies. For example, Nominet explains that the recommendations in the Petition will improve intensity of use because they "will support the further utilisation of white spaces devices . . .

---

3 Rural Partners Comments at 2.

4 CAN Comments at 2.

5 PIOs Comments at 1–2 (internal quotation marks omitted).

while continuing to provide robust protection to licensed users."[6] Evolve Cellular and Skylark Wireless recognize that granting the Petition will also "encourage innovation in new radio technologies and vastly improve rural broadband performance while maintaining stringent requirements of noninterference."[7]

The record developed in response to the Petition reflects that the Commission should "act quickly to issue an FNPRM advancing these proposed changes."[8] Doing so "would demonstrate the Commission's continued commitment to bridging the digital divide."[9] It would also allow the Commission, Microsoft, and all other interested parties to gather additional information on the questions raised by commenters and to more fully evaluate the potential for unlocking additional spectrum in rural areas for broadband connectivity using White Spaces technology.

I. COMMENTERS SUPPORT ALLOWING HIGHER RADIATED POWER LIMITS IN LESS-CONGESTED AREAS.

The Petition requests that the Commission seek comment on increasing the EIRP limit for fixed WSDs operating in less congested areas from 40 dBm to 42 dBm, through an increase in antenna gain, but not in conducted power.[10] Commenters agree, explaining that this change "would both increase the quality of access in challenging geographies and provide better coverage flexibility."[11]

---

6 Nominet Comments at 1.

7 Evolve/Skylark Comments at 5.

8 CAN Comments at 2.

9 App Association Comments at 2.

10 Petition at 4.

11 CAN Comments at 2.

"Permitting fixed WSDs to operate at a maximum EIRP of 42 dBm in less congested areas," the Public Interest Organizations note, "is a modest change that [will] allow[] TVWS operators to cover more customers with a given amount of investment, a critical factor in the availability and affordability of rural broadband."[12] 6Harmonics explains that, "to improve the economics of deployment, keeping down the cost of the client station installation is key. By allowing an increase in antenna gain, the conducted power required to close the link is reduced as is the cost."[13] The Wireless Internet Service Providers Association ("WISPA") agrees, stating that permitting fixed WSDs to operate at a higher maximum EIRP of 42 dBm in less congested areas "will enable TV white space networks to deploy over larger geographic areas, an improvement that may compensate for the relative shortage of vertical infrastructure in rural areas."[14] Overall, "[i]ncreasing radiated power by allowing greater directional gain will directly improve the cost-to-coverage ratio for providers and allow them to serve more Americans by enabling more homes to be served from a single tower."[15]

As commenters explain, this change and the associated coverage benefits are readily achievable: "it is both practical and feasible to implement compliant devices that utilize the increased power limit in rural areas."[16] Implementation of the proposal would come with "minimal administrative burdens as it would merely extend the existing methodology used for the WSDBs [White Spaces Databases] to determine the available channels that can operate at

---

12 PIOs Comments at 6.

13 6Harmonics Comments at 1.

14 WISPA Comments at 2.

15 Rural Partners Comments at 3.

16 Adaptrum Comments at 2.

this higher power limit in less congested areas."[17] The Commission can allow this change with "no impact on existing broadcast services, because any increase in power limits would be matched by increases in separation requirements from broadcasters."[18] The National Association of Broadcasters ("NAB") agrees that the FCC should move forward with an FNPRM on this proposal: "Particularly given the Commission's recent action to require automatic geolocation for TVWS devices . . . it may be possible for TVWS devices to operate at the EIRP levels Microsoft proposes without causing harmful interference to existing licensed operations."[19]

The proposed change would have no effect on the existing rules for WSD operations in Channel 37.[20] The adjacent-channel protection requirements for the mobile service downlink already limit the radiated power for fixed and personal/portable WSDs operating in Channel 37 to 40 mW.[21] We do not propose to change these rules.

The Commission therefore has ample support to move forward with an FNPRM that proposes changes to the Part 15 rules that will allow fixed WSDs to operate at radiated power levels up to 42 dBm. This improvement will facilitate the deployment of fixed wireless

---

17 DSA Comments at 5.

18 CAN Comments at 2.

19 Comments of the National Association of Broadcasters at 1–2 ("NAB Comments").

20 *Cf.* Comments of the American Society for Healthcare Engineering of the American Hospital Association at 3 ("ASHE Comments"); GE Healthcare Comments at 1–2 ("GEHC Comments"). *See also* Petition at Appendix A, Proposed Revisions to § 15.707 (specifying that fixed WSDs may only operate above 10 W (40 dBm) EIRP below Channel 37); 47 C.F.R. § 15.709(a)(3)(i).

21 *See* 47 C.F.R. § 15.712(i).

broadband to underserved areas more economically and effectively, and the Petition includes appropriate conditions to prevent interference to incumbent services.[22]

II. THE RECORD REFLECTS STRONG SUPPORT FOR WSD DEPLOYMENT UP TO 500 METERS HEIGHT ABOVE AVERAGE TERRAIN UNDER CERTAIN CONDITIONS.

Commenters support the proposal to increase the HAAT limit from 250 meters to 500 meters, subject to appropriate separation distances and a coordination requirement. This improvement will allow WSD operators to deploy in new locations or on existing towers that would expand rural service, but where deployment is currently foreclosed due to the height limit.[23] Adaptrum explains that, in working with rural operators, it has observed that the current HAAT limit prevents operators from providing service in important mountainous rural communities: "For instance, a community in Southern Virginia was exploring use of TVWS systems, but many of the sites targeted were not viable due to the HAAT limit."[24] Other commenters echo this concern. A group of rural broadband providers notes that the current height limit "often blocks our companies from deploying on the hills or other terrain features that contain the only existing sites for structures and backhaul necessary to provide coverage to our communities or are the only feasible sites for such construction."[25] Sacred Wind states that it has two existing communications towers it could use for White Spaces operations, but for the current

---

[22] *See* 6Harmonics Comments at 1; Adaptrum Comments at 2; CAN at 2; DSA Comments at 5; NAB Comments at 2–3; Nominet Comments at 2; PIOs Comments at 6–7; Rural Partners Comments at 3; WISPA Comments at 2.

[23] *See* 6Harmonics Comments at 4; Adaptrum Comments at 3; CAN Comments at 3; DSA Comments at 6; NAB Comments at 3; PIOs Comments at 7–8; Rural Partners Comments at 5–6; Wi-Fi Alliance Comments at 4; WISPA Comments at 3–4.

[24] Adaptrum Comments at 3.

[25] Rural Partners Comments at 5.

HAAT limit, "and has surveyed other areas for new tower installations that are above 250 meters HAAT, that could otherwise accommodate TVWS antennae in order to serve many homes beyond reach of other spectrum."[26]

These scenarios represent missed opportunities to connect additional homes, schools, and communities currently unserved with existing technologies. Connect America Network therefore notes that "[i]ncreasing this limit from 250 meters to 500 meters is a commonsense step that would support the use of TVWS technology to connect rural America."[27] The Commission could straightforwardly implement this rule change without additional risk of harmful interference to licensed services. Dynamic Spectrum Alliance explains that the HAAT proposal in the Petition "would extend the existing methodology for determining available channels" to ensure that incumbents remain protected.[28]

Subject to the conditions Microsoft has explained in the Petition, NAB "believes the Commission should consider allowing operations at heights above average terrain of up to 500 meters."[29] Indeed, "[b]ecause the proposal would require coordination for operations above 250 meters HAAT, it should not increase risk of harmful interference to television viewers."[30] As explained in the Petition, the layered interference protection approach that combines separation distances and coordination both prevents harmful interference and addresses any perceived difficulty in identifying an unlikely source of interference.

---

26 Sacred Wind Comments at 6–7.

27 CAN Comments at 3.

28 DSA Comments at 6.

29 NAB Comments at 3.

30 PIOs Comments at 7–8.

The Commission need not limit a HAAT change to less congested areas.[31] Doing so would be unnecessary to protect incumbent users—WSD use under revised rules will still comply with channel and location availability as indicated by the White Spaces Database ("WSDB"), which "will continue to ensure that incumbent operations will be protected from harmful interference."[32] Further, the proposed rules in the Petition specify that the increased HAAT limitation would not apply in Channel 37 or above.[33]

Given the record support for this proposal, the feasibility of implementing the technical rules required, and the Commission's policy goals, the Commission should move quickly to issue an FNPRM that includes an increased deployment height for WSDs of 500 meters HAAT under certain conditions.

III. COMMENTERS SUPPORT THE PROPOSAL TO PERMIT FIXED WSD OPERATIONS WITHIN GEOFENCED AREAS, INCLUDING ON MOVABLE PLATFORMS.

The record also supports issuing an FNPRM that proposes rules to allow fixed WSDs to operate on mobile platforms in geofenced areas, similar to the operation the rules currently allow for personal/portable WSDs.[34] Several parties explain that many useful applications could employ fixed WSD technology using geofencing: "Such geofenced operations can support rural industry broadly, and particularly, agriculture and extractive industries, where construction,

---

31 *See* Comments of Sennheiser Electronic Corporation at 1, 6 ("Sennheiser Comments"); Comments of Shure Incorporated at 1–2 ("Shure Comments").

32 Wi-Fi Alliance Comments at 4.

33 *See* Petition at Appendix A, Proposed Revisions to § 15.707. *Cf.* ASHE Comments at 1; GEHC Comments at 1–6.

34 *See* Petition at 24–25 & Appendix A, Proposed Revisions to § 15.711; *see also* 6Harmonics Comments at 6; CAN Comments at 3; DSA Comments at 8–9; NAB Comments at 3–4; Nominet Comments at 6; PIOs Comments at 8–9; RADWIN Comments at 2; Wi-Fi Alliance Comments at 6.

transportation, or farm equipment can operate within a defined area."[35] As a group of rural WISPs and White Space equipment makers explains, "[p]ermitting fixed TVWS device operations on moveable platforms using geofencing technology will allow residents, students, and workers in rural areas to access the internet in communities where they otherwise might not always have reliable access."[36]

Commenters demonstrate, as explained in the Petition, that proposed rules will protect licensees from harmful interference. NAB explains for context, "[t]he Commission's current rules permit geofenced operations for Mode II personal/portable TVWS devices. Microsoft seeks an analogous rule that would permit fixed TVWS operations on platforms (such as vehicles) that operate within a pre-defined area on channels determined using the interference protection rules that would apply throughout that area."[37] As the Wi-Fi Alliance notes, the location re-check interval combined with shutoff parameters near the limit of the geofence would prevent interference: "Fixed white space devices operating within this geofence would be allowed to operate on moveable platforms, and the geolocation coordinates would be checked every minute; when the fixed white space device's geo-coordinates come within 1.6 km of the geo-fence boundary—roughly the distance a vehicle moving at 60 mph travels in a minute—the white space device would cease operation."[38] 6Harmonics agrees, "[w]ith a 60 second channel availability check any additional risk of interference is unlikely."[39] "Provided available channels

---

35 DSA Comments at 8.

36 Rural Partners Comments at 6.

37 NAB Comments at 4.

38 Wi-Fi Alliance Comments at 6.

39 6Harmonics Comments at 6.

and power limits are computed appropriately," Nominet explains, "this approach has no effect on the risk of interference compared to a fixed device."[40]

Two commenters ask about the parameters that would be required to prevent harmful interference.[41] The Petition squarely addresses these questions. For example, Shure Incorporated raises the issue of speed limits for mobile platforms with fixed WSDs.[42] The Petition's proposed 60-second location re-check interval and 1.6-kilometer shutoff distance would effectively prevent operation outside the geofence at interstate highway speeds—a vehicle traveling 60 miles per hour travels roughly 1.6 kilometers in 60 seconds.[43] Any special speed limit for White Space devices would merely impose unneeded, unjustified regulation on rural operators. And as the Petition explains, the requirement that the fixed WSD continue to contact the database to confirm that its pre-determined channel of operation remains available would account for the possibility of changed channel availability due to wireless microphone registrations.[44] Nonetheless, an FNPRM will provide wireless microphone companies with the opportunity to provide technical analysis of their products in this context.

Based on the support expressed by numerous commenters, the Commission should issue an FNPRM that includes proposed rules that would permit fixed WSD operations on movable platforms within geofenced areas, subject to channel availability determined by the WSDB and the location re-check and shutoff requirements outlined in the Petition.

---

40 Nominet Comments at 6.

41 *See, e.g.*, Sennheiser Comments at 5; Shure Comments at 8.

42 Shure Comments at 8.

43 Petition at 24 & Appendix A., Proposed Revisions to § 15.711.

44 *Id.* at 25.

VI. COMMENTS CONFIRM THAT CLARIFIED NARROWBAND IOT RULES WOULD SUPPORT RURAL INDUSTRIES.

The record also overwhelmingly supports Microsoft's request that the Commission propose a new, clarified framework for narrowband Internet of Things ("IoT") operations. As 6Harmonics points out, existing Commission rules could be interpreted to support some forms of narrowband operation, however the FCC has not provided concrete procedures for certifying narrowband IoT equipment. Existing test procedures do not contemplate the use of channels narrower than 6 MHz.[45] In the absence of guidance that allows White Space devices to be certified under existing rules, however, a clear and robust set of rules specifically designed for IoT would accelerate the development of this emerging class of devices. NAB agrees that "the Commission should move forward with a Further Notice including this issue."[46]

As rural internet service providers, manufacturers, and other organizations highlight, the use of White Spaces spectrum for IoT has the potential to benefit rural industries, taking advantage of the propagation characteristics of low-band spectrum to "enable new, innovative uses of TVWS spectrum in the agriculture, mining, and environmental monitoring sectors."[47] In fact, just last week, the Commission announced the formation of a Commission task force to connect American farms.[48] In doing so, Chairman Pai explained that "using technology to put more and better food on our tables . . . [is] the present and the future of American agriculture, and we must do whatever we can to support these producers and enhance precision

---

45 6Harmonics Comments at 4–5.

46 NAB Comments at 5.

47 Rural Partners Comments at 7.

48 FCC News, Press Release, *Chairman Pai Announces New Task Force Focused on Connecting American Farms and Ranches* (June 17, 2019), https://docs.fcc.gov/public/attachments/DOC-358005A1.pdf.

agriculture."[49] The Petition's proposal for clarified rules for narrowband IoT operations in White Spaces spectrum presents a significant opportunity to advance those important goals.

One commenter raises possible operation on channel 37.[50] But the Petition's proposal for narrowband IoT would not apply to that Channel. As the proposed rules attached to the Petition make clear, "[n]arrowband white spaces devices cannot operate in frequencies above 608 MHz [the top of Channel 36]."[51]

NAB observes that the narrowband IoT "appears to be directed at urban IoT applications."[52] It is true that IoT WSDs could be valuable in both urban and rural areas. However, as a practical matter, the combination of the interference protection rules we propose in our Petition, combined with the expected very limited availability of multiple contiguous White Spaces channels in more densely populated areas, will for the most part limit IoT WSD use to less-densely populated areas.

This is one reason we strongly disagree with Sennheiser's unsubstantiated claims contention that narrowband IoT devices pose a risk of harmful interference to licensed and unlicensed but WSDB-registered wireless microphones. Sennheiser overlooks the fact that narrowband IoT devices would be subject to the same technical restrictions, including power limits, separation distances, and database control, that apply to all other White Space devices.

Further, Microsoft understands that all classes of WSDs—fixed, personal/portable, and any future IoT WSDs—must share available channels in the UHF and VHF bands with unlicensed wireless microphones that are not registered in the WSDB. However, there is no need

---

49 *Id.* at 1.

50 *See, e.g.*, GEHC Comments at 4–6.

51 Petition at Appendix A, Proposed Revisions to § 15.707(c).

52 NAB Comments at 5.

for additional special protections for wireless microphones beyond the mechanisms we propose in our Petition, such as duty cycle limits, which will further lower the risk of interference from IoT WSDs.

Finally, Shure has raised the possibility of subjecting IoT WSDs to the same emissions mask as wireless microphones operating these bands.[53] However, our understanding is that the applicable emissions masks assume a 200-kHz-wide channel, making it unclear how this mask would apply to IoT WSDs operating in narrower channels. This is the sort of detailed technical issue more appropriately addressed at the FNPRM stage.

V. THE RECORD SUPPORTS EXPLORING MECHANISMS TO ALLOW WHITE SPACE OPERATIONS ON FIRST-ADJACENT CHANNELS WITHOUT CAUSING HARMFUL INTERFERENCE TO BROADCASTERS.

The record confirms that the time is right for the Commission to seek comment on how to allow fixed White Space operation on first-adjacent channels to broadcasters at higher power levels without causing harmful interference. As rural WISPs and others have pointed out, the existing rules prevent rural broadband providers from providing full-power service unless they can do so at the center of three contiguous vacant channels. Lower-power operation remains available, without such a "triplet," but rural broadband connectivity typically requires higher powers to cover the distances involved.[54] Thus, even if many White Space channels are available in a rural area, rural companies cannot use them for broadband connectivity if television broadcasters have selected repacked channels in an inefficient way that unnecessarily eliminates

---

[53] Shure Comments at 14–15.

[54] *See, e.g.*, Rural Partners Comments at 4.

triplets. Thus, under the current rules, "even in rural areas, finding three contiguous white spaces is often difficult, making many empty channels effectively unavailable for rural broadband."[55]

NAB opposes Commission action to permit higher-power WSD operation on first-adjacent channels. Microsoft appreciates NAB's constructive and collaborative work on our Petition and therefore does not propose that the FCC include a proposal for such operation in the FNPRM. Instead, we ask that the Commission use the FNPRM to advance the discussion on this topic with the goal of finding a creative approach.

We believe that a solution can be found. The Commission has recognized that there is no reason, in principle, why higher-power fixed WSDs should not be able to operate on first-adjacent channels to broadcasters without causing harmful interference.[56] The only impediment is the development of a system of separation distances that ensures that the received signal strength of a television broadcast signal exceeds the signal strength of an adjacent-channel White Space device by a sufficient margin—fundamentally the same technical decision that must be made for devising *any* system of separation distances. Moreover, in the intervening years, new technological developments have made performing these calculations with sufficient accuracy straightforward—and would allow the FCC to build in sufficiently conservative margins. White Space database operators, for example, now have real-world experience using high-performance cloud implementations of terrain-aware propagation models, such as Longley Rice, that would allow the database to perform location- and broadcaster-specific propagation calculations

---

55 *Id*.

56 *Unlicensed Operation in the TV Broadcast Bands; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, Second Report and Order, 23 FCC Rcd. 16807, 16869–70 ¶ 178 (2008) ("Second R&O").

efficiently, and with great precision. Nominet, for example, has operated a White Space database using such a model in the United Kingdom since January 2016, proving its feasibility in a real-world implementation.[57]

In addition, as Microsoft argued in our Petition, broadcasters are in the process of transitioning to the new ATSC 3.0 standard. The Commission's existing record regarding the adjacent-channel protection requirements for digital television receivers should therefore be refreshed to capture the protection requirements of modern equipment. NAB argues in its comments that there is no evidence that new receivers will be more robust to adjacent-channel interference than legacy devices. But there is evidence that the new standard will in fact have more robust protections. NAB's *Next Generation Television (ATSC 3.0) Station Transition Guide* explicitly lists, as one of the opportunities presented by the ATSC 3.0 transition, "[t]he technology behind Next Gen TV will better reach viewers through a more robust signal."[58] IEEE also identified "more robust reception" as a key benefit of ATSC 3.0 deployment.[59] The robustness of an ATSC 3.0 signal does not, of course, relieve unlicensed services of their obligation to avoid causing harmful interference. But the assertions of ATSC 3.0 robustness certainly supports Commission inquiry into the updated protection requirements of an ATSC 3.0 system, whether they have changed in the more than ten years since the Commission's Second Report and Order, and whether this provides an opportunity for the Commission to use spectrum that is effectively fallow today to unlock new connectivity options for rural Americans.

---

57 Nominet Comments at 3.

58 NAB, *Next Generation Television (ATSC 3.0) Station Transition Guide* (Apr. 2019), https://nabpilot.org/wp-content/uploads/2019/04/NAB-ATSC-3.0-Guide_Final.pdf.

59 Wei Li, et al., *Coverage Study of ATSC 3.0 Under Strong Co-Channel Interference Environments*, IEEE Transactions on Broadcasting, Mar. 2019, at 73–82, *available at* https://ieeexplore.ieee.org/document/8360764.

CONCLUSION

Microsoft respectfully requests that the Commission issue an FNPRM proposing rules to adopt four of the improvements detailed in the Petition and seeking comment on the fifth—higher power limits in first-adjacent channels. The record reflects broad support for the modifications to the Part 15 WSD rules explained in the Petition, and the additional questions raised by commenters are well-suited to resolution through the proposed rulemaking process with the benefit of additional technical analysis and record materials. As WISPA explains, "[t]he rules proposed in the Petition offer real promise that deployment of fixed wireless networks on TV white space spectrum can develop into a prominent means of delivering broadband services to rural Americans."[60] The Commission should therefore move forward with an FNPRM expeditiously.

Respectfully submitted,

Paul Margie
Paul Caritj
Joely Denkinger*
HARRIS, WILTSHIRE & GRANNIS LLP
1919 M Street NW, Suite 800
Washington, DC 20036
(202) 730-1300

*Admitted in Colorado only. Practicing under the supervision of DC Bar members

Robert M. McDowell
COOLEY LLP
1299 Pennsylvania Avenue NW, Suite 700
Washington, DC 20004
(202) 842-7862

Paula Boyd
Senior Director, Government and Regulatory Affairs

Michael Daum
Director, Technology Policy, CELA Privacy and Regulatory Affairs

MICROSOFT CORPORATION
901 K Street NW, 11th Floor
Washington, DC 20001
(202) 263-5900

June 25, 2019

[60] WISPA Comments at 2.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and correct copy of these Comments has been served on the parties filing the statements to which the reply is directed, listed below, via first-class mail pursuant to 47 C.F.R. §§ 1.405(b) and 1.47.

Dr. Michael Davies
VP, Business Development
6Harmonics Inc.
21 Concourse Gate, Suite 10
Ottawa, ON K2E 7S4
Canada

Joel Thayer
Policy Counsel
ACT | The App Association
1401 K St NW, Suite 501
Washington, DC 20005

Haiyun Tang
CEO
Adaptrum, Inc.
2740 Zanker Road, Suite 100
San Jose, CA 95134

Tim Adams
Director of Leadership Development
The American Society for Healthcare Engineering of the American Hospital Association
155 North Wacker Drive, Suite 400
Chicago, IL 60606

Connect Americans Now
3001 Washington Blvd, 7th Floor
Arlington, VA 22201

Bob Nichols
CEO
Declaration Networks Group
8245 Boone Boulevard, Suite 230
Vienna, VA 22182

Mark N. Lewellen
Manager of Spectrum Advocacy
Deere & Company
801 17th Street, N.W., Suite 200
Washington, DC 20006

Martha Suarez
President
Dynamic Spectrum Alliance
3855 SW 153rd Drive
Beaverton, OR 97003

W. Scott McCollough
McCollough Law Firm LLP
2290 Gatlin Creek Rd.
Dripping Springs, TX 78620
Counsel to **Evolve Cellular, Inc. and Skylark Wireless LLC**

Ari Q. Fitzgerald
Hogan Lovells US LLP
555 Thirteenth Street, NW
Washington, DC 20004
Counsel to **GE Healthcare**

Rick Kaplan
Patrick McFadden
Robert Weller
National Association of Broadcasters
1771 N Street, NW
Washington, DC 20036

Justin P. Kempley
Policy & Public Affairs Lead
Nominet
Oxford Science Park
Oxford, OX4 4DQ
United Kingdom

Michael Calabrese
Amir Nasr
New America's Open Technology Institute
740 15th Street NW, Suite 900
Washington, DC 20005

Adi Nativ
Vice President, Global Business Development
RADWIN LTD.
900 Corporate Drive
Mahwah, NJ 07430

Jeff Kohler
Co-Founder and Chief Development Officer
Rise Broadband
61 Inverness Drive East, Suite 250
Englewood, CO 80112

John W. Badal
CEO
Sacred Wind Communications, Inc.
5901-J Wyoming Blvd NE, Box 266
Albuquerque, NM 87109

Joe Ciaudelli
Director, Spectrum Affairs
Sennheiser Research & Innovation
1 Enterprise Drive
Old Lyme, CT 06371

Catherine Wang
Ross Slutsky
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Avenue, NW
Washington, DC 20004
Counsel to **Shure Incorporated**

Alex Roytblat
Senior Director of Regulatory Affairs
Wi-Fi Alliance
10900-B Stonelake Blvd., Suite 126
Austin, TX 78759

Stephen E. Coran
Lerman Senter PLLC
2001 L Street, NW, Suite 400
Washington, DC 20036
Counsel to **Wireless Internet Service Providers Association**

/s/ Madeline Shaw
Madeline Shaw